ANATOMY OF A CASE OF CYSTIC ADENOMA OF THE THYROID GLAND.

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So seldom do we have the opportunity of making a complete dissection of a marked case of goitre that the writer feels no need to apologize for publishing the anatomic details of the following case and illustrating them by a complete series of figures.

The drawings were made from the body of a seemingly full-blooded negress, aged 55, case 14,729, John Sealy Hospital, said to have died of asthenia.

Fig. 1, showing the external appearance of the tumor, indicates the fat, well-developed character of the body. In the neck in the middle line and on either side of it, extending from the hyoid bone to the sternum, is a tumor which is so prominent on the right side as to rather obscure the evidence of swelling on the left. The sternomastoids are somewhat separated by the growth and overlap it at the sides. The tumor is globular and shows indications of lobulation. Its right half is roughly 7 c.m. broad and 8 c.m. long in its greatest diameters, while the left half does not lend itself readily to measurement. The right half of the tumor overlaps the middle line.

On dissection the skin was found to be freely movable throughout, the platysma on each side somewhat hypertrophied and the platysma muscles interlaced with each other below the hyoid. The anterior jugular veins were perfectly normal and did not seem to be enlarged. On reflecting the platysma the superficial layer of the fascia lata presented no peculiarity. It had the usual attachment to the hyoid bone, enclosed the sternomastoid on either side and split inferiorly as usual into two layers attached to the anterior and posterior lips of the upper border of the sternum and between the layers was the usual vein uniting the two anterior jugulars.

Fig. 2 shows the deep fascia reflected to expose the first layer of infra hyoid muscles and sternomastoids. The right sternohyoid which covers the larger lobe of the tumor is very much hypertrophied, especially in its breadth, the muscle measuring 5.5 c.m. across at its broadest (about midway between the hyoid and sternum) and narrowing at either end. It is just about twice the size of the normal muscle. Both omohyoids are markedly hypertrophied, the left sternohyoid not so, but here I may be in error as the left side of the tumor was exposed in embalming the body and the coverings damaged. The tumor is seen to dip beneath the sternomastoid on either side. No large vessels are apparent. Between this layer of infrahyoid muscles is a distinct layer of fascia stretching between and splitting to enclose them. It is the normal layer of fascia which unites these muscles and can scarcely be said to be hypertrophied. Thus we have in it a second layer of deep fascia over the tumor.

In Fig. 3 the sternohyoids, and omohyoids have been reflected, their fascia removed with them. The anterior edge of each sternomastoid has been deeply incised and the muscle partly drawn aside. The tumor is now found to be enveloped in a third distinct and in this case somewhat hypertrophied layer of fascia into which the sternothyroid muscles are inserted. These muscles are much hypertrophied, being each 5 c.m. broad at its sternal attachment. Each muscle extends as a muscular belly for about 4 c.m. upward from the sternum and is then lost in the fascia. There is no trace of an attachment of muscle or fascia to the thyroid cartilage, the fascia seems to have been stripped off the thyroid cartilage and retains its attachment only to the hyoid bone. No large vessels are yet to be seen except at each upper and outer angle of the tumor, where the superior thyroid vessels can be made out enveloped in fascia. The fascia laterally blends with the sheath of the sternomastoid. On the right lateral surface of the right lobe of the tumor a deep groove divides it into two masses. In the upper end of the groove a small portion of the upper end of the right sternothyroid muscle will be found (see Fig. 5).

In Fig 4 the sternothyroid muscles and the fascia belonging to

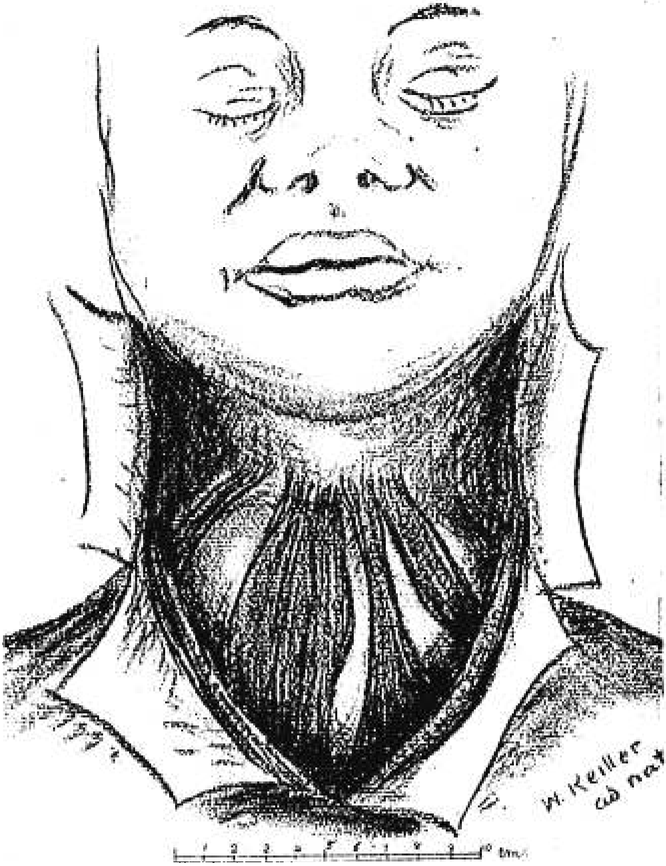

FIG. 2.—First layer of muscles.

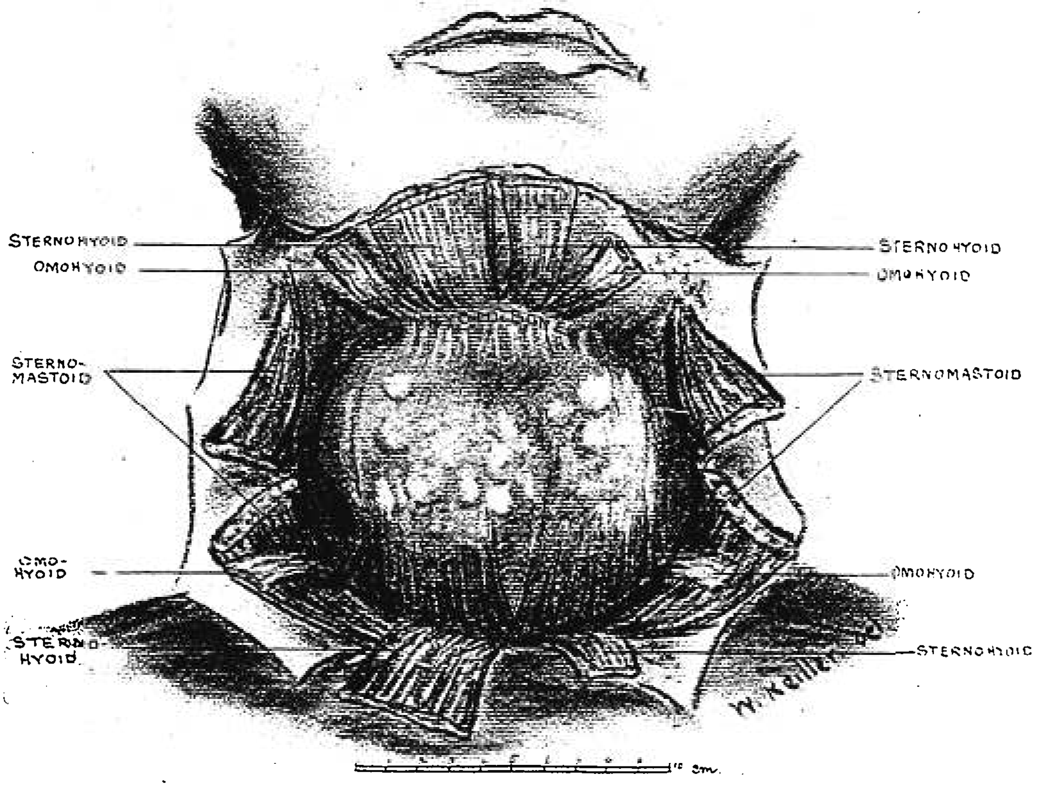

FIG. 3.—Second layer of muscles.

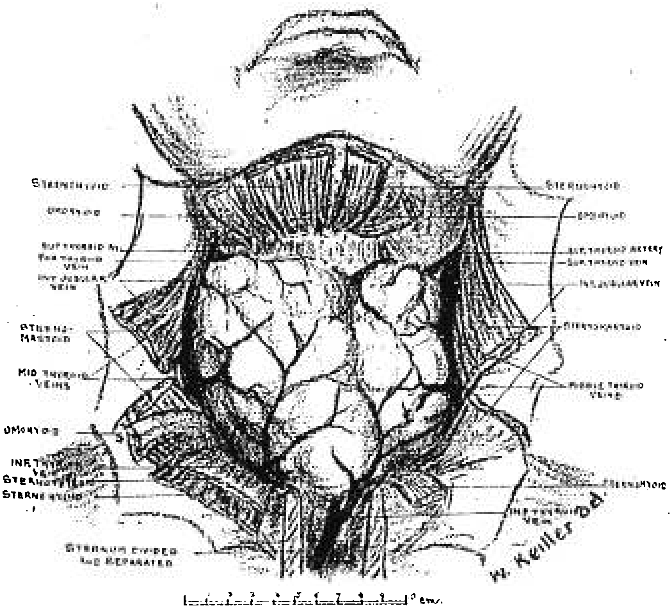

FIG. 4.—Muscles reflected. Capsule of tumor exposed.

them which were found to form a complete anterior investment for the tumor have been reflected and the proper capsule of the goitre has been exposed. The sternum has been cut longitudinally and the superior mediastinum opened the better to investigate the lower relations of the tumor. For the first time important vessels are encountered and the tumor, freed from its compressing investments, seems larger than in any previous stage of the dissection. The tumor is now seen to consist of a right and a left half, each further sub-divided and all enveloped in the same capsule. The right half of the tumor presents a posterior portion, elongated and shaped like an enlarged lateral lobe of the thyroid. It appears to be free from cysts and looks like simple adenomatous tissue (simple hypertrophy). All the rest of the right half and the whole of the left half of the tumor are markedly cystic, the globular prominences of the individual cysts being very numerous. The whole surface of the tumor is covered by a dense network of large veins whose size cannot rightly be estimated in their empty condition. They are imbedded in and almost inseparable from the capsule and the figure only gives a faint idea of the larger vessels. The internal jugular veins are pushed outward by the tumor mass, and each vein is as it were anchored to the capsule by three large branches, a superior thyroid vein at the upper angle of the mass (about the usual level of the vessel) and two middle thyroid veins, the lower of which is about at what should be the level of the cricoid cartilage, while the upper seems an accessory vein and lies at what should nearly correspond with the upper border of the thyroid cartilage. Rather deeply under cover of the sternum and springing from the inferior angles of each lateral lobe of the growth are two large inferior thyroid veins. These veins all anastomose freely over the surface of the growth and send great branches in between its lobes. Excepting the main trunks they are thin walled and imbedded in the capsule. The trunks of these veins are enlarged, suggesting in size average median or ulnar veins as they appear at the elbow. Enveloped in the capsule of the tumor at each upper lateral angle is the only artery so far met with, namely, the superior thyroid. It is accompanied by the superior thyroid vein and is distinctly enlarged. Each superior thyroid artery sends a branch over the surface of the tumor but passes mainly to its deep aspect. Its relations are practically normal and it is easily accessible to ligature. Coursing over each lateral surface of the tumor is the ansa hypoglossi, which has been dissected out of the fibrous capsule belonging to the muscular layer.

In Fig. 5 the two halves of the tumor have been separated to show its deep relations. In incising the capsule along the line of division between the two halves of the tumor many veins required double ligation before being cut. This done, the two portions were separated so as to get at the deeper vessels. The superior thyroid arteries with companion veins were divided between ligatures on the side of the thyroid cartilage; the inferior thyroid arteries were ligated on the sides of the trachea. The relations and dimensions of the isthmus thyroidei unfortunatetly could not be made out with certainty, as it had been damaged in embalming the body. I think it was comparatively small (probably 1 to 1.5 c.m. in diameter) and firmly adherent to the first two rings of the trachea, a large branch of each inferior thyroid artery closely associated with it. The two segments of the goitre having been separated as in Fig. 5, the trachea and larynx are exposed. The tumor being bilateral there is no appreciable bending of the trachea, though there may be some slight narrowing. None of the rings are softened. A little separate cyst has remained attached to the front of the trachea in association with the right inferior thyroid vein. It is an accident of dissection and is not especially adherent. By fully retracting each half of the goitre the carotid sheath is exposed on either side. The vessels have been markedly displaced outward by the tumor. From under each carotid sheath 2 to 3 c.m. above the level of the sternum the trunk of each inferior thyroid artery is seen to emerge. Each artery divides into an ascending and descending branch, the latter going one to each lower angle of the goitre and joining there the corresponding inferior thyroid vein; while each ascending branch enters its own lobe close to the isthmus. The ascending branch of each inferior thyroid artery on the side of the trachea is in close relation to the recurrent laryngeal nerve, a point of the utmost surgical importance. The dissection shows that the inferior thyroid arteries might be ligated without danger to the recurrent laryngeal nerves either where they enter the

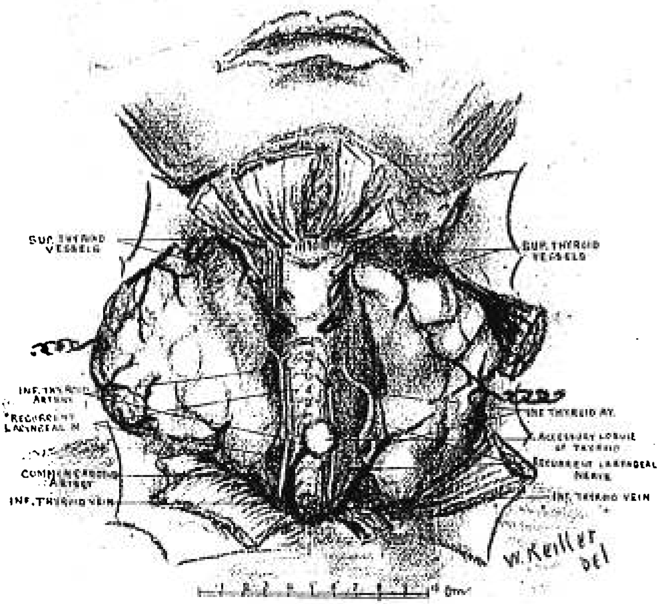

FIG. 5.—Tumor divided, trachea and vessels exposed.

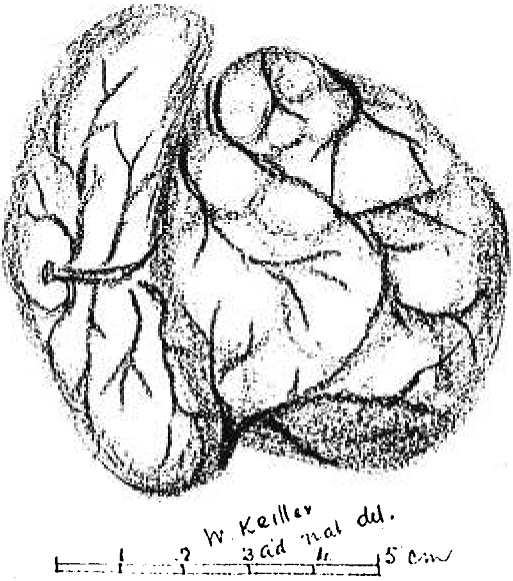

FIG. 6.—Outer surface of right lobe of hypertrophied thyroid.

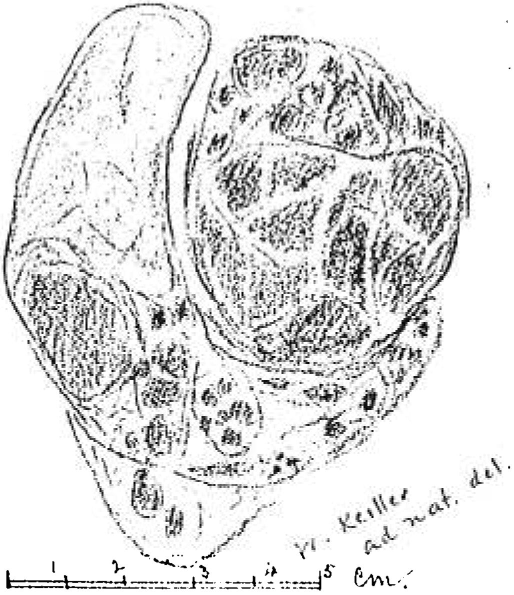

FIG. 7.—Section of right lobe of cystic thyroid gland.

tumor at the antero-lateral borders of the trachea (and here there would be at least two large branches, an upper and a lower previously described, to be ligated for each inferior thyroid artery), or the trunk of each vessel might be safely ligated as it emerges from under the carotid sheath. The trunk of the sympathetic is not visible. Dissection shows that its close relationship to the carotid sheath in which it is imbedded has caused its displacement outward with the common carotid artery. The superior thyroid artery and companion veins are easily accessible to ligature, as they course over the upper angles of the tumor. I could find no thyroideaima artery. Further dissection shows two large inferior thyroid veins, one opening into each innominate. Their trunks would be easily accessible, as the lower angle of each half of the growth is raised. The other veins are more accessible from the outer surface of the tumor as shown in Fig. 4.

It will be seen that there is a distinct difference in character between the deep and superficial portions of the right half of the tumor, the superficial part being a congeries of cysts, the deeper seemingly simply adenomatous. The section however shows that the deep portion of the tumor is also markedly cystic in its lower segment. A small upper part of the right sternothyroid is seen attached to the thyroid cartilage and reflected upward. It was found occupying the angle between the deep and superficial parts of the tumor superiorly and attached to the capsule formed from the fascia of the sternothyroid muscles (compare Fig. 4).

Fig. 6 is a drawing of the outer surface of the right lobe of the thyroid. The arrangement of one of the middle thyroid veins is well seen, of the superior and inferior thyroid veins, and also the difference in superficial appearance between the smooth posterior portion and markedly lobulated anterior portion of the growth. Fig. 7 shows that on section the difference is more apparent than real, the upper part of the posterior mass being the only portion free from cysts. The lower half of this portion of the tumor shows one large and many small cysts imbedded in a groundwork of simple adenomatous tissue; while the anterior part of the growth is one great mass of cysts with septa so thin as to be barely appreciable. All the vessels visible to the naked eye are in the capsule.

The left half of the tumor differs from the right half in presenting on its upper three-fourth an enormous number of smaller cysts, varying in size as seen by the naked eye from 2 m.m. to 3 c.m. in diameter. All these are evidently compound, each larger cyst being composed of many smaller ones whose capsules are thinning out toward obliteration, the capsule of the larger cyst being thickened. The lower fourth of this lobe has some normal gland in which are many small cysts. There were no post-esophageal or mediastinal extensions of the tumor. Microscopically the growth is a cystic adenoma of the thyroid gland.

The main points to be remembered in removing nonmalignant tumors of the thyroid body are:

(*a*) The danger from hemorrhage which is mainly venous, and constitutes one of the chief risks.

(*b*) The danger to the inferior laryngeal nerve.

(*c*) The danger of compressing the trachea or its collapse if its rings be softened.

(*d*) The danger of a peculiar postoperative toxemia probably from absorption of thyroid secretion, which is according to most operators greatly increased by much pressure on the tumor during its removal.

(*e*) The danger of myxedema if the whole gland be removed.

Bearing these points in mind the dissections in this case seem to me to teach the operator the following lessons:

Easy access is essential to safe and speedy removal and with this in view, I would use a V incision, the upper limbs of the V beginning at the anterior border of each sternomastoid a little below the level of the angle of the jaw when the head is thrown back, and following the anterior border of each muscle and meeting about one inch above the sternum in the middle line. In this incision skin and platysma should be cut, large branches which frequently unite the anterior jugulars with the external jugulars looked for under the platysma and divided between ligatures near the upper angles of the wound, the anterior jugulars themselves farther down, and the vein joining them just above the sternum. The next incision should be exactly along the same lines, should cut the omohyoids and sternohyoids as far from their hyoid attachments as will admit of picking up the lower ends and reuniting them at the end of the operation.

The next sweep of the knife should take in the sternothyroids and the sheet of fascia which stretches between these and thence to the sternomastoid over the tumor (see Fig. 3). No large vessels should be encountered so far (except the anterior jugular veins and their connections). It might be possible with care to avoid the ansa hypoglossi supplying the hyoid depressors and thus preserve these muscles. The nerves should be found descending obliquely to the hyoid depressors over the carotid sheath in the upper two inches of the incision on either side. With the view to saving these nerves and also to avoid injury to the veins of the immediately underlying special capsule of the goitre I would start with careful division of the muscular belly of the sternothyroid above the sternum and follow the fascia up cautiously on either side. This last incision should enable the operator to throw up a flap consisting of all the hyoid depressors and the fascia connecting them which would fully expose the thyroid gland in its proper capsule. So far bleeding should have been easily controlled. The head should now be bent forward to relax any pressure on the veins which course over the goitre, and its general relations can be thoroughly examined to determine the extent and method of removal. Remembering the importance of avoiding pressure on the trachea and in the light of the dissection before us (Fig. 5) it would seem best to begin by dividing the veins and capsule between ligatures over the median dividing line between the right and left segments of the growth. No vein should be cut without being first ligatured, lest it retract within the capsule and be troublesome to catch again. Thus the two halves of the tumor could be separated, the trachea exposed, and the character and relation of the growth made out. In this case one would readily see the comparatively healthy character of the deep portion of the right half of the tumor, and the superficial cystic portion could be removed by ligature of the superior thyroid vessels at the upper and inner angle, of the upper branch of the inferior thyroid artery in front of the trachea near the isthmus, of the inferior branch of the inferior thyroid artery and the inferior thyroid vein at the lower angle of the tumor well forward and out of the way of the recurrent laryngeal nerve. Turning the gland now to the inner side cautious division of branches of the middle thyroid veins between ligatures would enable the operator to remove the superficial cystic portion of the growth. Nothing should be cut except between ligatures.

My uncertainty about the isthmus in this case does not enable me to argue from this dissection; but the experience of surgeons would suggest the division of the isthmus between ligatures as a step to be taken as soon as that part is fully exposed. The general cystic condition of the left lobe, taken together with the comparatively healthy character of the deep portion of the right lobe which we have resolved to preserve, should determine the complete removal of the left half of the goitre. The inferior thyroid vein is ready of access and should be first ligated and cut at the lower angle of the tumor. Rolling the tumor gently outward the inferior thyroid artery will be readily and safely accessible as it emerges from under the carotid sheath, thus avoiding risk to the recurrent laryngeal nerve which is close to the trachea. The superior thyroid vessels can now be taken at the upper angle of the growth; and lastly, turning the mass toward the middle line the middle thyroid veins will be ligated and divided as far as possible from the internal jugular. The cysts which our section reveals at the lower angle of the part we have resolved to leave need not trouble us, as experience teaches that they are likely to atrophy after operation. In closing the wound the depressors of the hyoid bone should be stitched together to preserve their function, and the danger attending the absorption of the thyroid secretion, the risk of venous oozing, and the difficulty of complete obliteration of the postoperative cavity suggest the necessity of gauze drainage at the lower angle of the wound. Elevation of the lower end of the bed and avoidance of a pillow might lessen the risk of mediastinal infection.